

McGraw

Machinery.

ENGINEERING EDITION.

Index to Vol. IX.

New Series, Vol. I.

September, 1902, to August, 1903.

1903.

THE INDUSTRIAL PRESS,

66 WEST BROADWAY,
NEW YORK.

Index to Volume IX.

- Adjusting Motor, An (Lang) 87
 Air, Hydraulic Compression of 51
 Air Resistance Encountered by Moving Trains 20
 Alcohol for Industrial Purposes 466
 Allis-Chalmers Co., the Great West-Allis Plant of the 285
 American Methods, Westinghouse on 346
 American Turret Lathe Mfg. Co., New Shops of the 510
 Among the Shops; Notes from Shops of the Mergenthaler Co. 615
 Angular Milling and Planing Jobs 178
 Apprentice System of the Brown & Sharpe Mfg. Co. 327
 Armature Disks and Segments, Manufacturing, Jos. V. Woodworth 455
 A. S. M. E., Annual Meeting of the 254
 A. S. M. E. Meeting, The New York, 1902 211
 A. S. M. E. Papers, Saratoga Convention, June 23 to 26 585
 Automobile Show of 1903, The New York 307
 Barnay, John M., A Forty-four Foot Pit Lathe 279
 Batteries for Automobiles, Lead vs. Nickel 230
 Bearings for Lighthouse Lenses 390
 Bearings, Standard Roller Co.'s 396
 Benjamin, C. H.:
 Effect of Vibration on Steel Tubing 307
 Blake, C. F.:
 Worm Gearing 189
 Efficiency of Mechanism, 365-410
 Proportions of Gears 467
 Blanking Dies, Joseph V. Woodworth 13
 Blowing Engine for the Sharon Steel Co. 526
 Boiler Horse Power for Heating and Power, Chas. L. Hubbard 305
 Boiler Joints, Efficiency of 108
 Boiler Construction, Rapid Steam 464
 Boilers, Internally and Externally fired 240
 Bolts, Nuts for Clamping 54
 Booth, Wm. H.:
 Superheating 84
 Engine and Boiler Testing 570
 Boring Machine, A Spindle 278
 Boring Machine at the N. Y. Navy Yard, Large Vertical 337
 Boring Mill, Sixty-foot 578
 Brazing Cast Iron by the Pich Process 461
 Burlingham, William:
 Electricity as a Motive Power for Machine Shops 1
 Flywheels 520
 Camming Automatic Screw Machines 293
 Castings, Steel 524
 Chucking Carwheels for Turning the Tires, System of 437
 Concrete Foundations, R. P. King 613
 Cooley Epicycloidal Steam Engine, The 470
 Cooling Railway Motors by Compressed Air 255
 Correspondence Instruction, Notes on 239
 Cost, The Influence of, on Machine Design 404
 Countershafts, Strength of, Frank B. Kleinhaus 402
 Cramp & Sons Co., Philadelphia, Work in the New Machine Shop of Wm. 127
 Crane, "Hercules" Floating, at the New York Navy Yard 195
 Crankpin Turning Machine, A (H. B. Underwood & Co.) 427
 Cutting Tool Action, The Elements of 199
 Cutting Tools for Planer and Lathe, W. J. Kaup 644
 Cylinder Head Covers, Making, on a Steam Hammer 658
 Davis Armor Plate, The 17
 Death of I. McKim Chase 629
 Dies, Blanking, Joseph V. Woodworth 13
 Differential Indexing 275
 Drawing Room, The Lodge & Shipley, C. F. P. 68
 Drilling Jig Plates, J. R. Gordon 97
 Drum, A Large Hoisting 241
 Dunbar, J. H.:
 Pistons and Packing Rings, 180-401-457-529-582-633
 Early Machine Shop and Mechanics 74
 Efficiency of Mechanism, The, (1) C. F. Blake 365
 (2) With Special Reference to Hoisting Machinery 410
 Electric Motors, Specifications for, for Operating Navy Yard Machinery 200
 Electric Railroad, The History of 351
 Electric Railway, Another Interurban 135
 Electricity as a Motive Power for Machine Shops, William Burlingham 1
 Emery Wheels, The Bursting of 568
 Engine, A New Internal Combustion 302
 Engine and Boiler Testing, W. H. Booth 570
 Engine, Blowing, for the Sharon Steel Co. 526
 Engine, Results of Tests on High-speed 481
 Engine, The Cooley Epicycloidal Steam Engine 470
 Equipments for Motor-Driven Planers, Standard 298
 European Engineering Wks. 513
 Evolution of the Change Gear, The, (1) Oscar E. Perrigo 501
 (2) 572
 (3) 621
 Editorial:
 A Word of Discouragement 408
 Apt Phrase for the Mechanic, An 300
 Black Diamonds for Use in the Arts 80
 Cannot be Prevented 576
 Change Gear Devices and Geared Feeds 516
 Combining Practice with Education 628
 Danger from Gas Explosions 81
 Davis Armor Plate, The Effect of Gas on Coal Transportation 300
 Eight Years 16
 Electric Railroad, Edition of Machinery 16
 Engineering and Shop Editions, The 132
 Environment is Responsible 300
 Graphite vs. Friction 184
 Important Steam Turbine Development 17
 Insurance Engineering 409
 Inventor under Modern Conditions, The 464
 Is it a Fad? 516
 Light under the Bushel, The 132
 Liquid Fuel, for the U.S. Navy 185
 New Variable Speed Motor for Railways 81
 Possibilities of Liquid Fuel, The 133
 Rapid Steam Boiler Building 464
 Rotary Pumps, The 185
 Safe Cracking as a Fine Art 628
 Shop Accidents 408
 Status of Alcohol Motors, The 465
 Steel as an Abrasive 464
 Thermit and its Possibilities 352
 Transportation in New York 352
 What of the Large Gas Engine? 248
 Floors, Steel vs. Concrete for 412
 Flywheel Revolutions, Rule for Computing Safe 363
 Flywheels, William Burlingham 520
 Forced Blast Heating Systems, Notes on 509
 Forgings, Hollow 78
 Foundry of the Brown & Sharpe Mfg. Co., The new (1) 561
 (2) 623
 Foundry of the Vilter Mfg. Co., New 339
 Friction Test of Oils, Arthur W. Cole 631
 Fritz Medal, The John 188
 Garvin Machine Co., Notes from the 395
 Gas Engine Installation, The First Important (De La Vergne Co.) 233
 Gas Engines, Large Horizontal, Designed by the Westinghouse Machine Co. 302
 Gear Cutter Attachment for Cutting Internal Gears (Arthur) 130
 Gear-cutting Extraordinary: A Huge Drill Press Job 508
 Gears, High-speed Helical (Boston Gear Works) 54
 Gears, Proportions of, C. F. Blake 467
 German Milling Machine, Heavy 515
 Gold Dredging in New Zealand 240
 Gold, Reclaiming, from the Beds of Rivers; Novel Gold Dredging Machine 131
 Gordon, J. R.:
 Drilling Jig Plates 97
 Governor, A Friction Water-wheel 389
 Grimshaw, Robert:
 Internal Combustion Alcohol Motors 466
 Hammer Lifter, Semi-rotary Steam and Compressed Air (Merrill) 256
 Heat Resistance the Reciprocal of Heat Conductivity 523
 Heating and Power, Boiler Horse Power for, Chas. L. Hubbard 305
 Heating Systems, Notes on Forced Blast 509
 "Hercules" Floating Crane at the New York Navy Yard, The 195
 High-speed Planer Work 517
 Hollow Forgings 78
 Housing, Pattern for 65-ton 463
 Hubbard, Chas. L.:
 Boiler Horse Power for Heating and Power 305
 Hydraulic Compression of Air 51
 Indexing, Differential 275
 Industrial Center, New (Westinghouse) 150
 Inspection Department of the Garvin Mfg. Co., The 541
 Iron Works, Electric Equipment of an Architectural 618
 Isometric Drawing, The Theory and Application of the Principles of, A. B. Babbitt 602
 Jig Plates, Drilling, J. R. Gordon 97
 Jones, Forrest R.:
 Notes of Travel, 124-209-353-425-488
 Rotating Rings with Attached Lugs 253
 Kaup, W. J.:
 Cutting Tools for Planer and Lathe 644
 Keller Pneumatic Riveting Hammer, How Long 3-16 inch Holes are Drilled in 231
 Kleinhaus, Frank B.:
 Strength of Countershafts 402
 Lathe, 44-foot Pit 279
 Lathe and Planer Tools, Mammoth (Western Mfg. Co.) 108
 Lathe, Locomotive Driving Wheel, with Special Features 363
 Lathe, New Motor-driven (Flather) 376
 Lathe, Thirty-six Inch, Triple-gear (Bradford) 468
 Lightning Closes Down Niagara Falls Power Plant 364
 Localization of Industries 244
 Locomotive Manufacture in the United States 133
 Lodge & Shipley Drawing Room, The 68
 Machine Construction at the Pond Machine Tool Co., Notes on 338
 Machine Shop Formulas, A Development of, Stanley H. Moore 139
 Machine Shops and Mechanics, Early 74
 Machine Tool Metropolis, The 26
 Machine Tools and Machine Shop Practice During the Ten Years from 1890 to 1900 296
 Machinery at St. Louis Exposition, Classification of 218
 Magazine Habit, The, W. H. Sargent 460
 Markham, E. R.:
 Steel and Its Treatment, 11-71-120-175-245-317-377
 Masters, Arthur:
 Steam Steering Gear 21
 Mechanical Drawing 210
 Metallic Packings 619
 Meeting, National Machine Tool Builders' 577
 Metal-working Machinery, The Manufacture of 350
 Metric System, The 128
 Milling Machine, A German Worm, Robert Grimshaw 627
 Milling Machine, Heavy German 515
 Milling Machine, New No. 3 (Le Blond M. T. Co.) 423
 Moment of Inertia of a Plane Figure, Calculation of, Sanford A. Moss 518
 Moore, Stanley H.:
 Development of Machine Shop Formulas, A 139
 Moss, Sanford A.:
 Calculation of Moment of Inertia of a Plane Figure 518
 Motor Drives for Radial Drills 388
 Motor Power for Machine Tools 356
 National Machine Tool Builders' Association, Convention of the 135
 Navy Yard Apparatus for Testing Indicator Springs, New York 192
 Navy Yard, Large Vertical Boring Machine at the 337
 New Tools and Methods, Saving from 79
 New Tools of the Month 55
 (2) 112
 (3) 162
 (4) 212
 (5) 280
 (6) 332
 (7) 391
 (8) 439
 (9) 494
 (10) 554
 (11) 605
 (12) 659
 Niagara Falls Power Plant, Lightning Closes Down 364
 Nitroglycerine, An Outline of the Manufacture of 463
 Nixon, J. O.:
 Renold Silent Chain in Connection with Machine and Structural Tools 169
 Notes from Manchester, Eng. James Vose 404
 Notes of Travel, (1) Forrest R. Jones 124
 (2) German and Swiss Engines 209
 (3) Gas and Oil Engines in Germany 353
 (4) Unique Italian Pump and How its Photograph was Obtained 425
 (5) The Mills of the Ancients 488
 Nuts for Clamping Bolts 54
 Oil Cup, A Mechanical (Lunkenheimer) 390
 Oils, Friction Test of, Arthur W. Cole 631
 Ore Handling 469
 Packings, Metallic 619
 Patent, The Selden 461
 Pease, C. F.:
 Lodge & Shipley Drawing Room, The 68
 Perkins, Frank C.:
 Thermit Process, The 342
 Lightning Closes down Niagara Falls Power Plant 364

Perrigo, Oscar E.: Evolution of the Change Gear 501-512-621	Structural Tools, The. J. O. Nixon 169	Spur Gear Planer..... 149	Results of 481
Shop Construction, 65-117-173-236-290-347-399-452	Rope Transmission System... 462	St. Louis Exposition, Classi- fication of Machinery at. 218	Thermit Process, The. Frank C. Perkins 343
Pich Process, Brazing Cast Iron by the..... 461	Rotating Ring with Attached Lugs. Forrest R. Jones... 253	Stabel, Jos. M.: Tools and Methods for Ac- curate Thread Cutting. 566	Thermit, The Use of, for Repairing 345
Pins and Pin Machines..... 265	Rule for Computing Safe Flywheel Revolutions, Short 362	Standard Equipments for Mo- tor-driven Planers 298	Thread Cutting, Tools and Methods for Accurate. Jos. M. Stabel 566
Pistons and Packing Rings. (2) J. H. Dunbar..... 180	Sargent, W. H.: The Magazine Habit..... 460	Standard Roller Bearing Co., New Shops of the 396	Tidal Energy Converted to Power 444
(3) 401	Saving from New Tools and Methods 79	Steam Engine Economy..... 196	Trigg Co., Electrical Equip- ment of the Wm. R. Wil- liam Burlingham 1
(4) 457	Saw Bench, Illustrations of the Various Uses to which a Modern, can be put. I McKim Chase 543	Steam Engine in 1829, A Review of the. G. L. F. 523	Truck, Motor-driven, having Novel Variable-speed Mech- anism 361
(5) 529	Scale-making Firm, An Eng- lish: A Shop Built by James Watt 124	Steam Engine Specifications 358	Tubing, Effect of Vibration on Steel. C. H. Benjamin 307
(6) 582	School Training and Practi- cal Experience 571	Steam Motor Trucks..... 30	Turbine Development, Im- portant Steam 17
(7) 633	Screw Machine Automatic, for Making Screws with- out Waste of Material... 298	Steam Steering Gear. Ar- thur Masters 21	Turbines, Superheated Steam for 317
Planer, A Spur Gear..... 149	Screw Machines, Camming Automatic 293	Steam Turbine, The..... 136	Trucks, Steam Motor 30
Planer, Combined Standard and Open-side. (Flather). 256	Selden Patent, The 461	Steel and Its Treatment. E. R. Markham: 11	Turret Construction with Unlimited Capacity for Long Work 110
Planers, High-speed, Again. 577	Shop Construction. Oscar E. Perrigo: 65	(1) 11	Tyler, Chas. C.: Use of a Surveying Instru- ment in Machine Shop Practice 249
Planers, Standard Equip- ments for Motor-driven. 298	(2) The Guiding Condi- tions: General Features of the Buildings 117	(2) Methods of Heating Steel 71	Valuable Man of the Future, The 183
Plant of the Allis-Chalmers Co., Views from the Mil- waukee 407	(3) The Chimney or Stack; its Design and Construc- tion 173	(3) Annealing 120	Variable-speed Devices, Con- stants for. John S. My- ers 518
Polishing Room of the Brown & Sharpe Mfg. Co., New... 179	(4) Foundations 236	(4) Hardening Baths..... 175	Variable Speed Mechanism, A Geared. Fred S. English 548
Pond Machine Tool Co., Notes on Machine Con- struction at the..... 338	(5) Floors 290	(5) Examples of Harden- ing and Tempering..... 245	Vibration on Steel Tubing, Effect of. C. H. Benjamin 307
Power and Transmission, Notes on 405	(6) Heating the Buildings 347	(6) Casehardening 317	Vilter Mfg. Co.'s New Found- ry 339
Power Plant, Electrical, at Victoria Falls, Africa... 18	(7) Lighting—Arrange- ment of Windows and Lamps 399	(7) Answers to Inquiries... 377	Welding, Notes on Electric. 393
Power Plant with Novel Fea- tures. Geo. L. Fowler... 630	(8) Power 452	Steel Castings 524	West-Allis Plant, The Great Woodworth, Joseph V.: Dies, Blanking 13
Power Press, Electrically- driven, Large. (Northern Elec'l Mfg. Co.)..... 341	Shops of the American Tur- ret Lathe Mfg. Co., New. 510	Steel vs. Concrete for Floors Sturtevant Co., New Works of the B. F. 122	Manufacturing Armature Disks and Segments 455
Power Required for Lathes Using High-speed Tools... 398	Slotting Machine, An Eng- lish Locomotive Frame- plate 426	Superheated Steam for Tur- bines 317	Wreck in a Machine Shop, Railroad 492
Power Transmission Sys- tem 462	Slow-burning Construction... 413	Superheating, W. H. Booth. 84	Worm Gearing. C. F. Blake 189
Proportions for Gears. C. F. Blake 467	Specifications, Steam En- gine 358	Surveying Instrument in Ma- chine Shop Practice, The Use of a 249	
Pulley, A Monster Wood. (Reeves) 221	Springs, Winding Small.... 98	Swaging Machines and the Cold Swaging Process.... 449	
Pulley, The "Hercules" Steel Face 390		Technical Dictionary of the Society of German Engi- neers, The Universal 571	
Recollections of an English Machine Shop. C. Vickers. 507		Testing Indicator Springs... 192	
Renold Silent Chain in Con- nection with Machine and		Testing Machine, Hydraulic. (Riehle Bros.) 28	

Notes and Comment.

Alloy for Aluminum and An- timony 316	Dome, The Largest, in the World 83	Laboratory at Wardenclyffe, L. I., Tesla 134	Sault Ste. Marie Power Plant, The Great 83
Alloys for Aluminum 325	Dynamo-electric Machine for Testing Insulated Wire... 437	Laboratory, New Electrical.. 82	Secrecy, Machine Shop 289
Alternating-current Motors... 586		Lathe Tool for Thread Cut- ting 353	"Silicon" 517
Aluminum, Alloys for..... 325	Electric Furnace vs. Blast Furnace 368	Light, Attempt to Fix the Velocity of 480	Sketch Books for Engineers and Draftsmen 326
Aluminum and Antimony, Al- loy for 316	Electric Motor Built in 1851, Miniature 463	Light to Graduated Circles, To Convey, in Astronomi- cal Work 15	Slag for Foundations, Mol- ten 571
Aluminum Solder 18	Electric Railway, Another Interurban 135	Locomotives, Compound, are Twenty-five Years Old.... 19	Smoke was a Nuisance, Where (Signal Station P. R. R.) 82
Aluminum Solder 566	Electric Whip 221	Machine, Portable, for Coun- tersinking Rivet Holes... 26	Solder, Aluminum 566
Aluminum, Use of, in Gal- vanizing 16	Electrical Typewriter..... 17	Marine Engines and Boilers, Reduction in Weight of... 409	Statues for the Varied Arts Building, St. Louis Fair... 409
Aluminum vs. Copper in Electrical Work 140	Electricity Direct from Heat, Another Attempt at 18	Mercury, The Properties of... 195	Steam Consumption not Vir- tually Affected by Compres- sion 465
Armor Plate, High Price of. 618	Electrolysis, For Preventing 187	Metric System, Re The..... 378	Steam Shovels, Rapid Work with 131
Automobile Brake 50	File a Circumferential Groove in a Round Bar, To Fire in New Williamsburg 635	Microscope, Scheme for In- creasing Magnifying Power of 575	Steamer, The Largest, in the World 83
Automobile Parts, Electric- ally Welded 18	Fire in New Williamsburg 187	Molybdenum 378	Steel Freight Cars 18
Automobile Show, The Com- ing 135	Fire Protection, Armour In- stitute Department for In- struction in 577	Motor Equipment, Enormous, Applied to Minor Tools... 647	Steel Nickel, A Virtue of... 136
"Automobile," The Largest, (Combined Harvester and Traction Engine) 83	Floating Sawmill, A..... 357	Motor, Miniature Electric, built in 1851 463	Steel Tank, Largest, in the World 17
Automobile, The Lightest ... 18	Flooring of Clay Mixed with Cast-iron Turnings and Borings 249	Motors, Cooling Railway, by Compressed Air 255	Steel Ties and Rails, Wear of 617
Battery, Energy of Lead Cell of an Automobile Stor- age 409	Friction Device for Engines, Danger of the 577	Motors, Electric, in Coal Mines 644	Steel, To Anneal Self-hard- ening Steel for Drilling... 209
Bearings for Hoe Perfecting Press, Roller 353	Fritz, The Medal in Honor of John 19	Motors for Hoisting Purposes in Deep Mines, Electric.. 514	"Steel? What is?" 376
Blacksmith's Tilt Hammer, Setting a 516	Gas Engine whose Large Cy- linder receives Exhaust from Two Small Cylinders, Compound 462	New Jersey has been Fore- most, Wherein 249	Street Railway Line, Me- chanical Officials 517
Blueprint Paper for Deter- mining Positive and Neg- ative Poles of Electric Wire 319	Glass, A "Disease" of..... 304	Niagara Falls, Amount of Flow Over 519	Stresses Set Up in a Crank Web 517
Blueprinting, Discovery of Value in 575	Granite Columns, Huge 629	Niagara River at the Falls, Potential Power of..... 308	Submarine Boat "Fulton," Ocean Trial of the..... 134
Blueprints, Protecting, from Moisture and Grease..... 360	Hammer, Setting a Black- smith Tilt 516	Niagara Falls, Development of Water Power at..... 187	Summer School for Artisans. 528
Bridges, Long 275	Handling Trains on the West Va. Central R. R., Proposed Plan of..... 134	Oil Fields, Extravagant Pre- dictions regarding the.... 459	Tap for Clearing out Flns. Soft 353
Bridge, Progress on New Brooklyn 81	Harvester and Sewing Ma- chine Combinations 82	Packing Rings, Plumbago... 388	Telegraphic Keys, Typewriter for Operating 18
Bridge with Longest Span in the World 81	"Hathamite," The New Ex- plosive 602	Patent Case, Remarkable... 82	Telegraphy, Rowland Octo- plex System of..... 134
"Burning" Defective Iron Castings with Brass..... 355	Heating of Machinery, Paint to Indicate Exces- sive 98	"Permanent" Molds for Cast- ing Iron 19	Telephone Exchanges, Auto- matic 20
Cable, First, Across the Pa- cific 191	Heating Surface required in Feedwater Heaters 469	Pitting of Discharge Nozzle, Cause of the 196	Tensile Strength of Steel, Wrought Iron and Cast Iron 469
Canals at St. Mary's River, The 83	Hydrogen, Liquid 353	Planer Work, High-speed... 629	Texas Oil Fields, Extrava- gant Predictions Regarding the 459
Castings, Defective Iron, Re- paired by "Burning" with Brass 355		Power, Doubtful Sources of 328	Thawing of Frozen Water Pipes 278
Chambersburg Engineering Co., Notes from the Shops of the 515		Power Employed in Manufac- tures 319	Time Ball, The 435
Chronograph, Railway, The. 492		Power Plant, Another Gi- gantic Susquehanna 20	Tinning, Successful 436
Color Scale, Proposed 180		Power Transmission Line, 105 miles long, at Guana- juato, Mex. 235	Tire-turning Work, Interest- ing 553
Concrete Dam at Ithaca, N. Y. 186		Private Property by Railroads when Required for Right of Way, To Prevent Con- demnation of 464	Tool Steels, What can be done with the New 301
Concrete, Varied and Exten- sive Use of 18		Radium 365	Torpedo boat Destroyer "Wolf," Breaking up of the... 187
Condenser, Evaporative 52		Radium 547	Turbine, Steam, for Fire Service 18
Copper for Covering Hulls of Vessels 19			Turbo-generator at Yale & Towne Plant 586
Corrosion in Steel Structures 32			
Cramp Shipyard, History of 28			
Crane, Electric, for Loading Vessels 623			

Victoria Falls (Africa) Elec- trical Power Plant.....	18	Well, Sinking a Large.....	82	Wire, Expedients Resorted to in the Manufacture of Fine.....	517	Works, New, of Pedrick & Ayer Co.	623
Volume of a Sphere, Ap- proximate.....	54	Wire Cables, Ratio of Di- ameter of, to Pulley Sheaves.....	52	Wireless Telegraphy on the Pacific Coast.....	20	Yacht is Well Named, This..	82
Watervliet Arsenal.....	585			Wood, The Lightest, Known..	415	Zinc for Cleaning Chimneys.	386
Weighing, Delicacy in.....	629						

Engineering Review.

Accidents, Investigation by U. S. Consular Officers of Methods to Prevent Rail- road.....	473	Cooling Auditorium by Air Passing over Ice.....	587	Jig for Laying Out and Drill- ing Holes in Jigs.....	311	Shafts, Why Marine Engine, break without Apparent Cause.....	89
Acetylene Gas for Lighting Isolated Homes, Growing Use of.....	532	Cooper-Hewitt Electric Mer- cury Lamp and Stationary Converter.....	371	Joint, Improved Boiler.....	91	Slide Rest, The History of the.....	309
Accumulator, The Rateau.....	636	Cranes, Power for Electric Crankpin Grinding Machine, Locomotive.....	588	Joints Tight, Making Large Threaded Pipe.....	88	Slipping of Locomotives at High Speed.....	536
Adjustment of Steam Engine Shaft Governors.....	207	Current, Conversion of Alter- nating into Direct.....	590	Kerosene as a Disinfectant Kroonland, The Steamship..	90	Solders for Metal.....	312
Aero-Condenser of 4,500 H. P. An.....	205	Curtis Steam Turbine, The..	475	Lathe Work, High-Speed....	593	Spring of a Substance not Af- fected by Heat.....	33
Air, Cushion, A High-drop Test of an Elevator Safety	148	Cutlery, A New Process of Making.....	92	Leaks in Concrete, Treat- ment of, with Oil.....	637	Steamboat, The Largest Riv- er, in the world.....	587
Air-Pump Exhaust.....	588	Cutting Action of High-Speed Steel.....	638	Lining Shaft Bearings of Ma- rine Engines.....	89	Steam for Extinguishing Oil Fires.....	532
Air Pumps and Condensers, Independent.....	535	Cutting Angles of Tools, The De Dion-Bouton Self-ignition Device for Internal Com- bustion Motors.....	472	Liquid Air Engines, Tests on Ljungstrom Condenser, The..	536	Steam Turbine Plant, A Novel.....	310
Air, Resistance of, to the Movement of Flywheels.....	261			Locomotive Explosion at Ra- venna.....	33	Steam Turbines for the Rapid Transit Subway, New York.....	143
Alloy that resists the Action of Acids, Hot or Cold....	264	Device for Drawing off Con- densation from Cylinders without wasting Steam, German.....	532	Locomotive Performance as Tested by Von Borries, German.....	37	Steel, Another Tool.....	258
Aluminum, Uses for.....	309	Double Planer Tool for Ma- chining Driving Boxes....	96	Locomotive Practice, French Locomotive Spark Arrester, The.....	312	Steel Castings in Locomotive Construction, Extensive Use of.....	92
American Engineer in Eng- land, The.....	147	Draftsman to the Workshop, The Relation of the.....	147	Locomotives, P. R. R. Pur- chase of.....	473	Steel, Crushed, and Steel Emery.....	537
American Workman from English Workman's Point of View.....	590	Drawing Office Equipment: Universal Drafting Ma- chine.....	641	Locomotives, Superheated Steam, Schmidt System..	418	Steel, Deterioration of, Caused by "Internal Wear"	259
American Inst. Elec. En- gineers, "Student" grade, The.....	472	Drives, Electric Shop.....	421	Machine Design Ideas by Prof. Sweet, Some.....	201	Steel Driving Wheel Centers Cast with Solid Rims....	201
Aluminum in Metal Patterns, The Use of.....	141	Dynamite and Its Dangers..	435	Machine, Universal Hole Grinding and Lapping....	477	Steel Frame Buildings, Dura- bility of.....	369
Anglemeter, An Indicating	643	Electric Motors to Planers, Application of Reversing, Electric Power in Rolling Mills.....	201	Marconi Wireless Telegraph Co., Sixth Annual Meet- ing.....	473	Steel in the U. S., The Pro- duction of.....	38
Arnold Electric-pneumatic Railway System.....	538	Electric Shop Drives.....	421	Margin Lines and Titles for Drawings, Lithographed..	141	Steel Ingots, Compressing by Wire-drawing in the Ingot Mold.....	141
A. S. M. E. Committee Re- port on the Metric System	533	Electric Traction System of Berlin.....	532	Marietta, Babcock & Wilcox Boilers in the.....	478	Steel, Regarding the First, made in America.....	534
Automobile and Railway as Transport Agents.....	628	Electric Transmission, The Economy of.....	259	Marine Engines, Horse Pow- er of, Measured by Shaft Torsion.....	90	Steels, High-speed Tool....	537
Automobile for Heavy Duty Automobiles in place of Street, Elevated and Sub- service Cars.....	432	Electrically-equipped Houses, Electrolysis and Water Me- ters.....	637	Metallurgical Section, Ameri- can Foundrymen's Asso- ciation.....	416	Stevens Institute, New Presi- dent of.....	370
Axles, Hollow Pressed Car.	538	Elevators, Hydraulic, for Of- fice Buildings.....	34	Metric System, A. S. M. E. Committee Report of the..	533	Superheated Steam, About..	310
Bank Motor, The.....	477	Engine of 6,000 H. P., Roll- ing Mill.....	91	Metric System, Re The.....	588	Superheated Steam in Sta- tionary Plants, Use of....	474
Battery, New Alkaline Stor- age.....	472	Engine Overloaded? When is An.....	421	Milling Cutters with Under- cut Teeth.....	260	Superheated Steam Locomo- tives, Schmidt System....	418
Battleship, The Modern....	371	Envelope Folding Machine, An.....	427	Motor, The Bankl.....	477	Technical Schools, From the Telephone Receiver, Extra- ordinary Sensitiveness of the.....	532
Bearings, Friction of.....	421	Experiment in Electric Pow- er Transmission.....	636	Motors for Machine Tools, Continuous-current.....	262	Testing Generators, The Hop- kinson Method of.....	313
Blueprints, Peroxide of Hydrogen for Intensifying Color of.....	488	Fan Blower for the Cupola Furnace.....	314	Motors, Variable Speed....	587	Testing Wire, New Method of.....	371
Boats built so as to be Transported in Sections..	33	Fast Steamers for the Cunard Line.....	205	National Bureau of Stand- ards, Report of.....	472	Text Books.....	540
Boiler, Largest Steam, Ever Built.....	532	Fastenings for Emery Wheels and Grindstones.....	206	Nickel Steel, More about the Properties of.....	369	Thermometers, Standardiza- tion of.....	637
Boiler, the Tomson.....	475	Feeds, Remarkable Drilling, Finished Machine Work....	534	Nickel Steel, Remarkable Properties of.....	310	Third-rail Line, New Electric between Wilkesbarre and Hazleton, Pa.....	472
Boiler Tubes, Apparatus for Inspecting Interior of.....	474	Fireboxes, Vanderbilt, Col- lapse Because of Defective Circulation (?).....	33	Oil, Petroleum Lubricating..	534	Third Rail System of the B. & O. R. R., Electric.....	38
Boiler Tubes do not Vibrate, Long.....	201	"Fireproof Wood" So-called. Floating Fire Traps.....	205	Oil Testing Machine and Some of Its Results, New..	263	Tomson Boiler, The.....	475
Boiler with Corrugated Waist and Firebox, Loco- tive.....	208	Floorplate with Removable Sections, Machine Shop....	207	Oil Wells, The Beaumont..	533	Tool, Portable Universal Ma- chine.....	417
Boilers, Babcock & Wilcox, in the Marietta.....	478	Flywheel and Boiler Explo- sions Compared.....	203	Packing Rings, Tool for Cutting off.....	316	Towing Canal Boats by Pow- er.....	472
Boilers, Horse Power of....	144	Flywheel Capacity for En- gine-driven Alternators..	264	Pads for Blow-off Pipes, Re- enforcing.....	637	Traction Engine, A Novel..	419
Boilers, Notes on Tubular..	94	Flywheel Explosions and Their Cause.....	261	Patents, Bill relating to....	416	Traction Increaser, Locomo- tive Magnetic.....	534
Blower for the Cupola Fur- nace, Fan.....	314	Flywheels, Safe Speed for..	142	Patents, Report of the Com- missioner of, for the Year 1902.....	416	Trade Secrets in France, Pen- alties for Divulging.....	88
Brass Tips on Cast-Iron Pro- pellers, Burning.....	94	Friction of Ball Bearings....	421	Peat for Fuel.....	312	Transatlantic Railway, The..	532
Bridge, Plans for the Fourth, across East River Bridge, Plans for Third New York.....	416	Friction of Water in Pipes..	39	"Pedrail"—A Novel Traction Engine.....	420	Transmission, Electrical vs. Coal Car.....	371
Briquetting Fine Ores and Flue Dust.....	261	Gas Distribution, High- pressure.....	588	Petroleum Fuel, Solidified..	259	Truck, A Ten-ton Steam....	258
Briquetting of Flue Dust to be Tried.....	369	Gas Pipe Line.....	534	Piping, Heavy Steam.....	260	Truck, Electric, for Machi- nery Transportation.....	258
Brush Patent, Expiration of the.....	416	Gear, Heisler Compensating, for Direct-acting Pump- ing Engines.....	639	Pneumatic Tube Service....	141	Tubes, Manufacture of Seam- less Boiler.....	591
Buffings, Method of.....	201	Gearing, Herringbone, with Cut Teeth.....	418	Power House? Quicksand Un- dermining "Soo" Canal....	636	Tubing and Tube Furniture in Germany, Metallic.....	535
Cables, Protection of Suspen- sion Bridge.....	315	Generator and Motor, A Pos- sible Slow-speed.....	310	Power, New Step taken in the Generation and Distri- bution of.....	369	Turbine, Adaptability of the, to Superheated Steam....	202
Carborundum, New Use for, Carnegie Institution at Washington, D. C.....	416	Girders, Well-preserved Iron. Grease Lubrication of Loco- motive Driving Boxes....	636	Power Station, New Fisk St., in Chicago.....	587	Turbine Equipment of Hart- ford Electric Light Co., The Steam.....	369
Carwheel, Machinery for the Manufacture of the Schoen Carwheel, New Form of..	142	Grinding and Lapping Ma- chine, Universal Hole.....	477	Press, Hydraulic Forging..	372	Turbine, Intallation, Large Steam.....	375
Castings, Heat Treatment of White-Iron.....	539	Headlight with Horizontal and Vertical Beams.....	96	Profit-Sharing and Its Re- sults, Real.....	417	Turbine, The Curtis Steam..	475
Castings without a Cupola, How to Make Small.....	34	Heat Treatment of Steel Rails and Structural Shapes.....	141	Pulley, How a Large, was Turned to a Smaller Di- ameter.....	90	Turbines, Total Aggregate Power of Steam.....	587
Cedric, The.....	134	Heating and Ventilating the Machine Shop.....	589	Punching Machines, The Va- riable Speed Element in the Operation of.....	311	Underfeed Stoker, History of the.....	145
Cement Plant, New Edison..	34	Holting from Great Depths Hot-well as an Oil Extractor, The.....	638	Reheaters in Compound En- gines, The Use of.....	479	Union Engineering Building, The.....	533
Chimney, Large Armored Concrete.....	474	Horse Power, Yearly Cost of One Steam.....	374	Reheaters and Superheating Reheating Air, Economy of, Report of National Bureau of Standards.....	588	Vacuum, Effect of, on Steam Turbine.....	639
Coal Car, Evolution of the Coal Dust Burning, The Conditions Necessary for, Coin for St. Louis Exposi- tion, Imitation 1,000,000- 000 Gold.....	372	Indicator, The Richards Steam Engine.....	592	Rolling Mill Driven by a Gas Engine.....	37	Valves for High-pressure Steam, Large Stop.....	314
Compound Locomotives, Proper Handling of.....	144	Interchange, The Broadening Effect of.....	534	Salt, Manufacture of, as an Adjunct to a Power Station	587	Washing Moving Trains, Ap- paratus for.....	637
Compressed Air, Practical Points Regarding.....	88	Internal Grinding Machines Iron Bridge, The First.....	313	Selenium, Properties of....	33	Welding Locomotive Frames in Situ.....	260
Concrete Pile Construction..	37	Iron Works, To Commemo- rate the first, in America	588	Self-ignition Device for Inter- nal Combustion Motors....	472	Wheels, Disk and Spoke....	638
Concrete vs. Steel for Floors Condenser, The Ljungstrom Condenser using Moist Air as Condensing Medium, Sur- face.....	480			Shafting, Manufacture of Cold-rolled.....	536	"White Coal" Convention..	472
Condensers and Cooling Tow- ers for the Power House of the New York Sub- way.....	36					Wire, New Method of Test- ing.....	371
Construction, Slow-Burning.	413					Wireless Telegraphy.....	259
						Wood Fireproofing Process..	636
						Worm Thread Contact, The Nature of.....	309

Items of Mechanical Interest.

Alloys for Lining Bearings, Crankpins, Bushes, etc....	160	Fire Pump, Electric.....	221	Oil Grooves in Shafts.....	160	Stenciling Countershaft	
Band Saws, Method of Re- pairing	549	Food Products, Preservation of, by Freezing	652	Oil Grooves, Machines for Cutting	223	Speeds	277
Bearing, A New Anti-friction	329	Gages, Accuracy of Limit....	549	Oiling Pillow Blocks, New System of Automatically..	329	Stud Setter and Extractor..	277
Bearing in Use over Two Years, Thrust	489	Glass, A Substitute for Ground	160	Packing, High-pressure Pis- ton, of English Design....	277	Take-up Device, Indicator...	222
Belt, A Monster Leather....	278	Globe Valves with Lever and Scale	160	Petroleum as Fuel.....	160	Tap Screws in Tail Shaft Lin- ers, Uselessness of.....	160
Belt Law, A New.....	222	Glue, Tests of the Strength of	108	Polonium	594	Telegraph and Telephone Wires, Humming of.....	489
Belt, Coil Spring Driving...	109	Graphite in Cakes	221	Pulley, Expanding	161	Telephone Support, Conven- ient Office	654
Boiler, Rupture of a Large Scotch, under Test.....	549	Guide, Compressed Steel Ele- vator	654	Pump, Electric Motor Worm- driven	490	Thermometer, Fahrenheit's...	489
Calcium Carbide for Obtain- ing Heavy Pressures	221	Hanger, Simple Cable.....	595	Pumps and Steam Traps, Comparative Efficiencies of	654	Tire-setting Machine for Wagon Wheels, Hydraulic.	221
Callipers, Reading Vernier...	222	Hardening Steel an Ancient Practice	488	Rapid Cutting with Taylor- White Steel Tools	160	Tool Holders, Mammoth Lathe and Planer	109
Car, Steel Freight, of 300,000 Pounds Capacity	653	"Invar"	594	Ratchet Mechanism, Novel..	489	Tool with Inserted Cutters, German Lathe and Planer.	329
Cement, Receipt for Pipe Joint	108	Joints, Efficiency of Boiler..	108	Recoil of Large Guns.....	161	Traction Engine, Mammoth.	552
Chuck, English Reversible Jaw	328	Key Duplicating Machine, A	330	Reversing a Single-Valve En- gine	490	Turret Construction with Unlimited Capacity for Long Work	110
Chimney, Strengthening a...	595	Letter Boxes, Improved.....	594	Shear, Electrically-operated Hydraulic	223	T-Slots, Cutting Circular...	550
Combustion Caused by Use of Lard and Animal Oils, Spontaneous	488	Magnalium	488	Slotting Machine of German Design	109	Valve Motion Model, Col- vin's	596
Cutter, New Type of Milling.	489	Magnetic Attachment, Draw- ing Board and T-Square with	277	Slow Burning Construction Sound, Rate at which, Trav- els	110	Valve, The Nodon Electric...	491
Drawing Board and T-Square with Magnetic Attachment.	277	Milling Hexagon Bolt Heads, English Method of.....	595	Spindle with Soft Thread, Hardened Lathe	328	Vaporizer, Mercury Valve...	491
Drill Drift and Hammer, A Combined	550	Milling Machine, An Inter- esting	550	"Stub" Switch, Novel Electric Steam Boat, the Oldest, Ply- ing in Vicinity of New York	329	Variable Speed Device...	490
Electric Motor, Operation of, in a Dust-laden Atmo- sphere	549	Molds, The Use of Perma- nent	654	Steam Pipe, Covering for Un- derground	160	Vibration on Elevated Trains	653
Engine, Mammoth Traction...	552	Nickel Steel Alloys, About...	653	Steering Gear, Steam, for U. S. Torpedo Boats	551	Whip, Electric.....	221
Engine, Reversing a Single- Valve	490	Nodon Electric Valve, The...	491			Wires, Humming of Tele- graph and Telephone....	489
File for Brass	595	"Norwich," The	488			Worm Gearing of High Ef- ficiency	161

Letters upon Practical Subjects.

Axles for Industrial Cars ..	41	Die, Hardening and Temper- ing a.—A Criticism.....	322	Lathe, Making a Hollow- spindle	430	Punch and Die for Perform- ing Six Operations Simul- taneously	429
Balancing Revolving Bodies.	156	Dies using Rubber as an Agent for Forming Diffi- cult Shapes	217	Leadscrew, Testing a.....	596	Punch and Die Making.....	155
Ball Bearing for Supporting Long Work on a Slotter...	154	Dogs, Patternmakers'.....	101	Lenses, Punches and Dies Used for Making Rim....	546	Punches and Dies for Draw- ing Odd-shaped Brass Cup	649
Ball Bearing Rings, Tool for Turning	50	Drafting Room Convenience, A	153	Letters upon Practical Sub- jects, Regarding	152	Punches and Dies Used in Making Rim for Lenses...	546
Ball, Turning a.....	544	Draftsman, Troubles of the	101	Long Job done on an Old Planer	48	Punch Press and Die.....	47
Bearing, Criticism of German Anti-friction	599	Drafting Attachment, A Du- plex	544	Machining a Special Casting, Tools for	152	Ratchet, A Reversible Fric- tion	323
Bearing for Oven Cars and Drawers	46	Drilling Fixture, A Handy...	429	Managing a Machine Shop, Methods Adopted in....	46	Right and Wrong Ways....	270
Belts, Lacing	47	Driver for Milling Machines, Improved	102	Manufacturing Conditions in California	385	Ring, Machining an Eccen- tric	650
Blanks, Bevel Gear, Formulas for	44	Duodecimal System, Favors.	379	Marking Drills and Taps...	213	Rings, Turning 96-inch Pis- ton	157
Boiler Settings, Regarding...	648	Eccentric Boring Attachment	212	Measurement, Favors a New System of	379	Roof, Wooden Saw-tooth...	650
Boilers, Get-at-able.....	157	Faceplate for Threading An- gle Flanges, Adjustable...	103	Mechanics in the Country...	44	Sawing, A Guide for.....	212
Boils, Cutting off, and Cham- fering the Heads.....	379	Flange Forming Tool.....	597	Meter, Equivalents of the...	322	Sensitive Attachment for Measuring Instruments...	215
Bolts, Screw Machine Tools for Making	268	Flooring, Notes on Shop....	428	Metric System, Discussing the	321	Slide Valves, Method of Ma- chining	269
Boring Bar, A Convenient...	212	Foreign Competition	424	Metric Leadscrew, The	482	Spanner, An Improved.....	50
Boring Bars	267	Friction, More About.....	43	Metric System in the Machine Shop, The	45	Spiral Gears Again	379
Boxes, Reboring Headstock...	159	Gate for the Machine Shop, Simple Sliding	547	Micrometer, An Ancient	322	Spirals, Cutting, on the Uni- versal Milling Machine...	382
Brass Working Tools.....	434	Gearing, Elliptical	269	Micrometer, An Inside	483	Spirals, More about Cutting	483
Break? What Caused this...	105	Gears, High-speed Helical...	433	Micrometer Measuring Instru- ments	486	Spliner, A Home-made....	48
Caliper, Long Range	105	Gears, Roughing and Finish- ing, Simultaneously	428	Milling Cams	43	Starting the Thread, Handy Device for	103
Centering Tool, A Handy...	320	Geometrical Progression...	321	Milling Fixture, A.....	107	Sub-press Die, The Construc- tion of a	600
Centering Work on the Face- plate	323	Good and Poor Management	599	Milling, Fixtures for Multiple	651	Suggestion to the Apprentice, A	266
Chuck, A Screw Machine...	101	Graduations on the Com- pound Rest	484	Milling Machine, A Contin- uous	214	T-Square Attachment, A Home-made	270
Chuck, A Screw Machine...	213	Graphite, Tests with Flake...	328	Milling Machine Attachment, An Automatic	430	Tapping Arrangement, A Safety	428
Chuck, Expansion, for the Screw Machine	267	Grooves, Device for Cutting Oil	49	Oil Tanks, Regarding Large...	268	Tapping Rig, A.....	100
Chucking Pieces	99	Hammer, The Graduated...	482	Oil, Viscosity of.....	484	Teeth, Spacing the, for a Rack Pattern	42
Chute, Pattern for an Oblique	272	Hints for Draftsmen, Some...	50	Operation Sheets	383	Theory and Practice	41
Clutch Pattern, Making A...	104	Hobbing Attachment for the Milling Machine, A.....	214	Packing Gland, Tools for a Brass	432	Tires, A Trick in Boring...	648
Clutch Pulley, and the Jig for Turning the Friction Shoes, A Friction	271	Holder for Broken Shank Drills	155	Pattern, How Should This, be Made?	266	Troubles of the Machinist- Engineer	99
Collars, Screw Arbor for Turning	266	Holders, Patent Tool, and Their Use	383	Pattern, Worm Gear, Laying out a	49	Turret Attachment for the Drill Press	485
Concrete, The Strength of...	482	Holes, Drilling Tapered, on the Radial Drill	266	Pipes and Fittings, Conven- tional Method of Drawing	158	Turret Attachment for the Lathe	103
Correction to "Proportions of Gears"	597	Hook, Fixtures for Forming Wire	482	"Piston Heads and Packing Rings"	104	Turret Lathe Tool, A Special	320
Correspondence Schools, A Word Regarding	107	How Foremen Differ	107	Plans Drawn Quickly.....	546	Units, Large vs. Small....	320
Counterbores, More.....	213	"How to Read MACHINERY"	384	Profitable Operation, A...	155	Valve and Piston Movements	216
Counterbores, Notes on....	106	Indexing, Compound	215	Pseudo-Perspective in Prac- tice, The Principles of...	652	Valves, Method of Machining Slide	269
Crankshafts, Tool for Turn- ing	598	Jig, A Handy, to have Around the Shop	268	Pulleys, Turning, in the Lathe	154	Vernier and Slide Callipers, An Attachment for.....	384
Curtain Hoist, An Automatic Electric	152	Jigs	102	Punch and Die, A Combina- tion	544	Viscosity of Oils.....	484
Curves, Drawing Compound...	157	Krupp's Economies, One of...	266	Punch and Die Job, A Spe- cial	380	Vise, Handy Toolmakers'...	648
Cutters, Attachment for Re- lieving Formed	324	Laps for Shop Use, Some Convenient	651	Punch and Die for Forming Ring or Tube in Two Op- erations	430	Where Shall the Break Come?	429
Cutting-off Tools, Patent...	484						
Cutting Point, The.....	545						
Cylinders, Making Steel...	380						

Shop Kinks.

Angle Plate, Adjustable.....	655	Boring Bar, A Convenient...	220	Vises	435	Dog, Special Lathe.....	219
Arbor, A Special	326	Bosses on a Pattern, Loose...	436	Clamps, Handy Planer and Shaper	604	Drill, Impromptu Extension...	604
Arbor, Combination	53	Center Rest Kink.....	274	Cutter, A Special Inserted Tooth Milling	436	Drill, Grinding a Twist	435
Back-facing Bar, A.....	219	Centering Work in Steady Rest	111	Cutting Keyways in a Lathe	111	Faceplate, Patternmakers' Lathe	53
Bending Eyes and Hooks, Tool for	220	Chisel, Jig for Grinding a...	275	Division, A Kink in	656	Faceplate, Locating Work on the	326
Boring and Threading Tool, A Deep	655	Collars, Jig for Drilling...	275	Dog "Never-slip" Lathe...	111	Facing and Chamfering Nuts,	

Tool for	219	Key, Pulling a Tight.....	274	Reamer Kink, A.....	274	Socket, A Novel Taper.....	385
Finger for Use on the Grind- er, An Adjustable	326	Link Ends, Proportions of...	111	Rings, Turning Piston.....	220	Tailstock, Lining up the....	274
Flange Coupling Was Re- paired, How a	219	Milling any Angle	604	Rollers, Making Thrust.....	385	Tool Box, Steel Legs for....	326
Gage, A Radius.....	604	Offset Center, An.....	436	Saw, A Home-made Milling..	386	Triangle, A Handy	326
Graduations on Tailstock Spindle	656	Plaster of Paris, Shop Use for	604	Scale and Square Attach- ment, A	386	Triangle Kink, A.....	219
Holder, Boring Tool.....	274	Pointing Tool with Circular Cutter	53	Scales with 1-100 Gradua- tions	219	Truck, A Tailstock.....	656
Holder for Curved Tools....	656	Pipe Bending Rig, A.....	435	Setting the Headstock for Taper	219	Truing Work in a Chuck....	111
Jigs, Locating, on the Face- plate	604	Punch for Thin Metal, Mak- ing a	386	Shaft, Turning an Awkward Slim Drills, Fixture for Mill- ing	220	Turning and Boring Simulta- neously	386
				Springs, Winding Small.....	274	Turret, A Toolpost	436
						Welding, A Shop Application of Electric	656

How and Why.

Answer to Question 11.....	438	22. Gearing, Involute vs. Epi- cycloidal	493	7. Power Required for Dif- ferent Cuts on Planer and Shaper	331	19. Shaft, Covering on Steel	493
14. Calipers, Proper Rating of	387	25. Governors, Centrifugal and Inertia	493	9. Power Required for Throwing Articles of Varying Weights	331	1. Shrink Fits, Allowance for	53
4. Casehardening a Special Malleable Iron Casting..	159	11. Grinding Job, Difficult..	331	9. Power Required to Throw 1 pound with a Velocity of 1 mile per minute...	331	9. Shuttle, Power required for Throwing	331
12. Contraction of Antimony	387	27. Horse Power of Engines and Boilers	553	18. Backs to Diametral pitch on the Shaper, Cutting..	438	28. Sprocket Wheel Pat- terns	553
23. Cracks in Blowholes in Castings, Filling	493	29. Horse Power of Steam Turbines	553	1. Reboring Boxes of Engine Lathes	53	8. Standard Inch, The....	331
5. Cutting Double Helical Gears	159	17. Hydraulic Accumulator..	438	16. Rotary Engines	387	3. Standard Pipe Threads	159
6. Duplex Pump, Capacity of a 4-inch.....	331	20. Lubricant for Turning Copper	493	21. Sewing Machines, Speed of	493	29. Steam Turbines, Horse Power of	553
26. Engineering Edition, Con- tents of	553	15. Pickling Iron Castings..	387			2. Teeth of Worm Gears, To Find Angle of.....	53
10. Gas Engines, Large.....	331	13. Planing Slide Valve and Seat	387			24. Welding of Tubing, Elec- tric	493
						2. Worm in a Lathe, To Cut	53

